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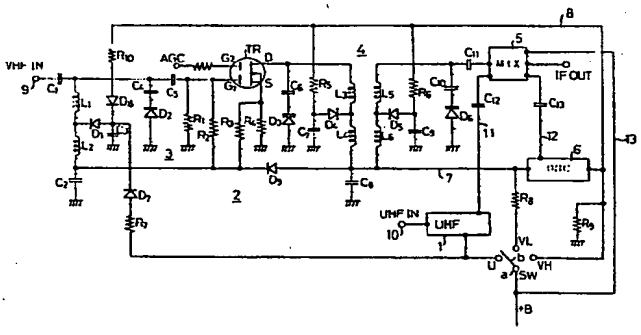
(54) TUNER.

(57) When one power supply voltage is applied as a band switching voltage from single throw triple pole switch to selectively switch between a VHF low band, VHF high band and a UHF band in a tuner unit used for a television receiver or the like, the second contact of the switch for selecting the VHF high band is connected through a second switching diode to the connecting point of a first switching diode for switching the tuning coil of a VHF input tuning circuit and a high frequency grounding capacitor, and a third contact of the switch for selecting the UHF band is connected through a third switching diode, and the first switching diode conducts even when receiving the UHF band. Thus, it can eliminate a harmonic wave of the VHF signal caused by the first switching diode from the VHF input circuit, thereby eliminating noise on the screen and faults when setting another band.



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SPECIFICATION

TITLE OF THE INVENTION

Tuner

FIELD OF THE INVENTION

This invention relates to a tuner used in a television receiver or the like, and more particularly to a tuner which is performable of band switching by use of a one-circuit triple-contact switch.

BACKGROUND OF THE INVENTION

Generally, a tuner for a television receiver or the like, employing a variable capacity diode as a tuning element, has a band switching circuitry which selectively switches a VHF low band, a VHF high band and a UHF band. Therefore, from the viewpoint of simplifying an electric power source for switching the band, it has been proposed that the one circuit triple-contact switch, which applies DC supply voltage selectively to each contact for the VHF low-band, VHF high band or UHF band to perform the band switching, is used for switching voltage.

The band switching mechanism in the conventional tuner using the one-circuit triple-contact switch, however, has a switching diode at a VHF tuner unit kept in not-biased condition when UHF is received, so that a VHF signal at high level given to a VHF input terminal, especially the non-linearity of the switching diode in

a VHF input tuning circuit, generates the harmonic frequency identical with the UHF band, resulting in that the harmonic wave is given into the input side at the UHF tuner unit to appear as noises in the picture. Such phenomenon is remarkable in a case that the VHF tuner unit and UHF tuner unit are encased in the same casing or the UHF and VHF signals from the antenna are divided by a frequency divider to be led to the VHF input terminal and UHF input terminal respectively. The reason for the former case is that the harmonic wave is easy to jump from the periphery of the switching diode to the input side of the UHF tuner unit in the casing, and that for the latter case is that the harmonic wave generated by the switching diode enters the UHF input terminal from the VHF input terminal through an external frequency divider. Hence, a tuner having both the above constructions in combination is further remarkable of the above trouble.

SUMMARY OF THE INVENTION

In the light of the above problems in the conventional tuner, this invention has been designed. An object of the invention is to provide a tuner which allows a tuning coil switching diode at a VHF input tuning circuit to be conductive when receiving the UHF band, thereby generating no harmonic wave, and which actually has such

construction to switch the band in the one-circuit triple-contact system without hindrance.

In order to attain the above object, the present invention applies supply voltage to a common contact at the one-circuit triple-contact switch, the common contact connecting the compound circuit. A first contact of the switch is connected to turn on a local oscillator and a radio frequency amplifying transistor in the VHF tuner unit, a second contact of the switch is connected to actuate tuning coil switching diodes and a radio frequency amplifying transistor and a local oscillator in an interstage tuning circuit of the VHF tuner unit, and connected to apply conducting voltage for a first switching diode through a second switching diode to the node of the first switching diode turned on to void a coil for a low band at the VHF input tuning circuit and a high-frequency grounding condenser, and a third contact of the switch is connected to a UHF tuner unit and also connected through a third switching diode to the node of the first switching diode and a high-frequency grounding condenser, thereby turning on the first switching diode when receiving the UHF band.

In the tuner having the band switching mechanism employing the one-circuit triple-contact switch as foregoing, the tuning coil switching diode in the VHF

input tuning circuit is turned on without being not-biased while receiving the UHF band, whereby, even when the VHF signal is given, no equivalent harmonic wave is generated by said switching diode in the UHF band, thus producing no noise in the picture.

Furthermore, the first switching diode for switching the tuning coil at the VHF input tuning circuit, when the UHF band is received, as abovementioned, is turned on by being given supply voltage from the third contact of the switch through the third switching diode. Hence, when the band other than the UHF band is received, the input tuning circuit and the third contact side are cut off by the third switching diode not to affect the UHF tuner unit. When the VHF high-band is received, the first switching diode is given drive voltage therefor from the second contact through the second switching diode, whereby when the UHF band is received, the input tuning circuit and the second contact are cut off by the second switching diode, thus not affecting the RF amplifier and local oscillator. Moreover, in the input tuning circuit, the second and third switching diodes are both connected to the high-frequency grounding condensers, so that both the diodes, even when turned off, will produce no harmonic wave.

These and other objects of the invention will become

more apparent in the detailed description and examples which follow.

BRIEF DESCRIPTION OF THE DRAWING

The drawing is a circuit diagram of an embodiment of a tuner of the invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

This invention will be detailed concretely in accordance with the accompanying drawing, in which reference SW denotes a one-circuit triple-contact switch having a movable part b connected to a common contact a and capable of connecting selectively with a first contact VL, a second contact VH, and a third contact U. Alternatively, any switch employing transistors or diode elements to be formed in an electronic circuitry manner, other than the above switch having the mechanically movable part b, may of course be available, so that the one-circuit triple-contact switch described herewith will include such electronically acting switch.

Reference numeral 1 denotes a UHF tuner unit given a UHF signal from an input terminal 10, and 2 denotes a VHF tuner unit except for the switch SW portion, both the tuner units being encased within the same box-like casing through a printed substrate. An interval construction of UHF tuner unit 1 is not concretely shown, but the VHF tuner unit 2 is shown in detail of an input

tuning circuit 3 and an interstage tuning circuit 4 and in block of a mixed circuit 5 and a local oscillator 6. References D_2, D_3 and D_6 denote variable capacity diodes, where tuning voltage supply lines thereto are omitted, TR denotes a radio frequency (RF) amplifying transistor, in which a first gate G_1 is given a RF signal selected by the input tuning circuit 3, and a second gate G_2 is given auto-frequency control voltage from a terminal AGC, L_1, L_3, and L_5 denote tuning coils for the VHF high-band, L_2, L_4 and L_6 denote tuning coils acting together with the coils L_1, L_3 and L_5 when VHF low-band is received, D_1, D_4 and D_5 denote switching diodes for switching the tuning coils, and C_1 to C_{13} denote condensers for DC cut-off and almost negligible of impedance with respect to the signals given to the condensers respectively.

The first contact VL at the one-circuit triple-contact switch SW is connected to the local oscillator 6 and the line 7. The line 7 is connected to the node of a condenser 8 and the cold sides of tuning coils L_4 and L_6 and further to the node of bias resistances R_2 and R_3 of the RF transistor, tuning coil L_2 and condenser C_2, through a fourth switching diode D_9 interposed in porality as shown.

The second contact VH of the switch SW is connected

to one ends of resistances R9 and R10, the other end of resistance R9 being grounded and the other end of resistance R_{10} being connected to the anode of a second switching diode 8, the cathode thereof being connected to the node of the first switching diode D1 and high-frequency grounding condenser C3. Also, the second contact VH is connected to resistances R5 and R6 through the line 8 as shown.

The third contact U of switch SW is connected to the UHF tuner unit 1 and to the node of the first switching diode D_1 and second switching diode D_8 through a current limiting resistance R7 and third switching diode D7. The output line 11 of UHF tuner unit 1 is connected to the mixed circuit 5 through a coupling condenser 12 and the output line 12 of local oscillator 6 is connected also to the mixed circuit 5 through a coupling condenser C_{13}.

The common contact a of switch SW is given DC supply voltage (+B), which is fed always to the mixed circuit 5 via the line 13 to thereby keep the mixed circuit 5 in an actuated condition regardless of the band switching, which purposes allowing the mixed circuit 5 to operate as an amplifier for an intermediate frequency (IF) output of UHF tuner when receiving the UHF band.

In the abovementioned tuner, when the movable part b

at the one-circuit triple-contact switch SW connects with the first contact VL, the drain D of RF amplifying transistor TR is given the supply voltage (+B) through the line 7 and the tuning coils L_4 and L_3 and the first gate G_1 and source S of transistor TR are under bias by a current flowing through the fourth switching diode D_9 and resistances R_2 and R_1 and those R_3 and R_4, whereby the RF amplifying transistor TR is actuated, at which time the switching diodes D_1, D_8, D_4 and D_5 are under inverted bias not to be conductive. The local oscillator 6 also is given the supply voltage (+B) through a resistance R_8 and actuated to feed its local oscillation signal to the mixed circuit 5, at which time the oscillator 6 is adapted to be set in the low band state by the supply voltage (+B) given from the first contact VL. The mixed circuit 5 outputs from its IF output terminal IFOUT an intermediate frequency signal generated by the beat caused by the RF signal of the VHF low band given from the VHF input terminal 9 through the input tuning circuit 3, RF amplifying transistor TR and interstage tuning circuit 4 and by the local oscillation signal from the local oscillator 6.

Next, when the movable part b connects with the second contact VH of one-circuit triple-contact switch SW, the local oscillator 6 is given the operating voltage

(+B) through the line 8, the voltage setting the local oscillator 6 in the high-band stage.

Further, the drain of RF amplifying transistor TR is given voltage from the line 8 via resistance 5, switching diode D_4 and tuning coil L_3, and a current flows from the line 8 to the switching diode D8 → that D_1 → tuning coil L_2 → resistances R_2, R_3 → resistances R_1, R_4 and from the line 8 to the resistance R5 → switching diode D_4 → tuning coil L_4 → 4th switching diode D_9 → resistances R_2, R_3 → resistances R_1, R_4 and from the line 8 to the resistance R_6 → switching diode D5 → tuning coil L_6 → 4th switching diode D_9 → resistances R_2, R_3 → resistances R_1, R_4, whereby the RF amplifying transistor TR is given bias at its first gate G1 and source S so as to be put in the actuated condition, at which time the switching diodes D_1, D_4 and D5 are on to put the tuning coils L_2, L_4 and L_6 in an inactive condition in connection with the high frequency through the condensers C_3, C_7 and C_9, whereby the tuner is kept in the state of receiving the VHF high-band.

Next, when the movable part b connects with the third contact U of one-circuit triple-contact switch SW, the UHF tuner unit 1 is given the operating voltage (+B) to be actuated and a current flows through the third switching diode D_7 → first switching diode D_1 →

tuning coil L_2 → resistances R_2, R_3 → resistances R_1, R_4 to thereby turn on the first switching diode D_1. In such state that the first switching diode D_1 is under bias in the forward direction so as to be conductive, even when the VHF signal is given, the switching diode D_1 scarcely generates the harmonic wave. In addition, the second switching diode D_8 and fourth switching diode D_9 interrupt the drain of RF amplifying transistor TR and the local oscillator 6 from being given the operating voltage, while the third switching diode D_7 serves to interrupt the UHF tuner unit 1 from being given the operating voltage when the VHF high-band is received.

In the drawing, a conducting current for the switching diode D_1, when receiving the UHF, flows to the earth through the tuning coil L_2, resistances R_2, R_1 and resistances R_3, R_4 to apply bias between the first gate G_1 and the source S of amplifying transistor TR, but the drain thereof is not under bias due to the cutoff of the fourth switching diode D_9, thereby keeping the amplifying transistor TR in off-condition. The bias resistance of amplifying transistor TR is used as the return circuit for the conducting current for the switching diode D_1, alternatively the fourth switching diode D_9 may be interposed on the line connecting the tuning coil L_2 and resistance R_2 and a return circuit resistance

may be interposed between the cathode of diode D_9 and the earth to thereby flow the current to the earth through the return circuit resistance.

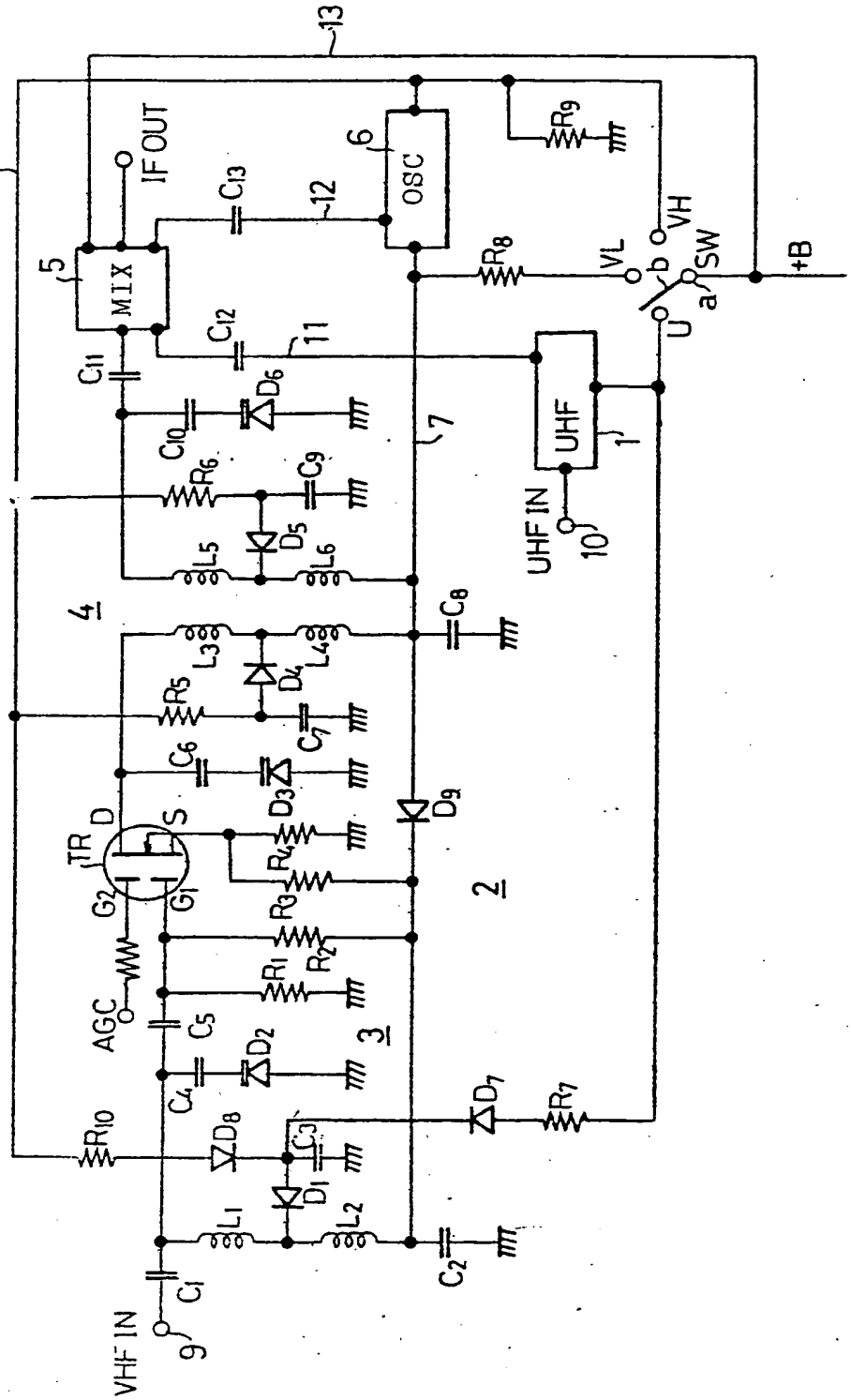
When the movable contact b connects with the first contact VL at the one-circuit triple-contact switch SW to receive the VHF low-band, the fourth switching diode D_9 is biased in the forward direction, but the switching diodes D_1, D_4, D_5, D_7 and D_8 are all biased in the backward directions. In case that the switching diodes D_1, D_7 and D_8 are extremely different in the inverted impedance, there is the probability that the diode D_1 is not sufficiently biased in the backward direction. In such case, each of diodes D_1 and D_7 or D_1 and D_8 is connected in parallel to a high resistance, so that the anode potential of D_1 need only be decided.

While the invention has been described in the preferred embodiment, it is to be understood that the scope of this invention is of course not limited to the above embodiment except as defined in the following claim.

What is claimed is:

1. A tuner device which uses a variable capacity diode as a tuning element, switches one supply voltage by a one-circuit triple-contact switch so as to be set selectively in a VHF low-band, a VHF high-band and a UHF band, and, when receiving the UHF band, uses a mixed circuit in a VHF tuner unit as an amplifier for an intermediate frequency of a UHF tuner unit, said tuner device characterized in that a common contact of said switch is given a supply voltage, said common contact connects with said mixed circuit, a first contact of said switch is connected with a local oscillation circuit and a radio frequency amplifying transistor in said VHF tuner unit to thereby enable said local oscillation circuit and radio frequency amplifying transistor to be turned on, a second contact of said switch is connected to switching diodes for switching tuning coils in an interstage tuning circuit and to said radio frequency amplifying transistor and local oscillation circuit to thereby enable said switching diodes, radio frequency amplifying transistor and local oscillation circuit to be actuated, and also with the node of a high-frequency grounding condenser and a first switching diode which is conductive to void a low-band coil at a VHF input tuning circuit, thereby applying to said node a conduction

voltage for the first switching diode through a second switching diode, and a third contact of said switch is connected with said UHF tuner unit and also with the node of said first switching diode and high-frequency grounding condenser through a third switching diode, thereby turning on said first switching diode when receiving the UHF band.



INTERNATIONAL SEARCH REPORT

0065013

International Application No. PCT/JP81/00330

I. CLASSIFICATION OF SUBJECT MATTER (if several classification symbols apply, indicate all) [2]

According to International Patent Classification (IPC) or to both National Classification and IPC

Int. Cl.[3] H04B 1/26, H03J 5/24

II. FIELDS SEARCHED

Minimum Documentation Searched [4]

Classification System	Classification Symbols
I P C	H03J 5/24, H04B 1/10, H04B 1/18, H04B 1/26

Documentation Searched other than Minimum Documentation to the Extent that such Documents are Included in the Fields Searched [5]

Jitsuyo Shinan Koho	1960 - 1981
Kokai Jitsuyo Shinan Koho	1971 - 1981

III. DOCUMENTS CONSIDERED TO BE RELEVANT [14]

Category *	Citation of Document, [16] with indication, where appropriate, of the relevant passages [17]	Relevant to Claim No. [18]
A	JP,B2, 52-15492 (Victor Company of Japan, Ltd.) 30, April, 1977 (30.04.77)	1
A	JP,B2, 51-43923 (Mitsumi Electric Co., Ltd.) 25, November, 1976 (25.11.76)	1
A	JP,U, 55-892 (Mitsumi Electric Co., Ltd.) 7, January, 1980 (07.01.80)	1
A	JP,Y2, 51-26582 (Toshiba Corp.) 6, July, 1976 (06.07.76)	1

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"T" later document published on or after the international filing date or priority date and not in conflict with the application, but cited to understand the principle or theory underlying the invention

"X" document of particular relevance

IV. CERTIFICATION

Date of the Actual Completion of the International Search [1]	Date of Mailing of this International Search Report [1]
February 5, 1982 (05.02.82)	February 22, 1982 (22.02.82)
International Searching Authority [1]	**Signature of Authorized Officer [20]**
Japanese Patent Office	

Form PCT/ISA/210 (second sheet) (October 1977)